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An Optometrist Looks at Perception.

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The relationships of sense modalities included in the broad term "perception" are explored. Vision is a transmission from external world to brain. Ocular mobility and spatial organization abilities are important to vision as it is involved in the perceptual-cognitive process. Kinesthetic and visual behaviors are interrelated and are supplemented by the haptic modality (sense of touch). Auditory perception produces imagery that far surpasses the kinesthetic or haptic senses and, in fact, rivals the visual sense as the major mode of learning. Teaching methods based on these sense modalities should endeavor to present a problem through one modality and then require a maximum number of modalities to be integrated into the response. Available materials which use this technique are listed, and references are included. (MD)

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AN OPTOMETRIST LOOKS AT PERCEPTION

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The title, "An Optometrist Looks at Perception" refers to an optometrist who is a consultant to early childhood education. The term 'perception' includes all of the major sense modalities, e.g., sight, touch, hearing and kinesthesia. This paper will explore the relationships of these sense modalities and their influence on a child's ability to learn and therefore, to read.

The terms, optometrist, vision and perception, are defined for this presentation as follows:

All optometrists are trained and concerned with the diagnosing and correction of the nitty-gritty aspects of vision, among which are acuity, refractive error, ocular motility, accommodative (clear focus) range, binocularity and the stability of these functions. Some optometrists are also trained and concerned with the impact of the total process of vision on the perceptual-cognitive process. Their capability extends to relating the nitty-gritty to learning

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ability, helping the child improve his visual functions and allowing vision to serve as the correlator and integrator of the other sense modalities. It is promulgated that efficient vision assists the child in applying his total energies to the learning process.

Vision is the process effecting the transmission of radiant energy in the external world through the eyes to the sensori-motor areas of the brain, the creation, then, of visual imagery based on past and present sensory inputs, and the subsequent projection of an effigy created by the brain into the external world. Included in the total process is the quantity and quality of detail (acuity) and the veridicality of the resultant effigy. The perceptual-cognitive process is affected by the match of the gravitational and visual inputs and the support of the haptic and auditory inputs. Therefore, the output might be expected to reflect any of the vagaries of the inputs. Note, first, that the acuity of the 'eyes' is only a <u>contributing</u> factor, as are the other sense modalities to the total process of vision, and second, that the perceptual-cognitive process operates within an affective as well as sensori-motor realm.

Perception can be defined narrowly, as Piaget does, as an infinite number of fixations that follow a point to point order and which is impossible to recreate. Even a duplicate stimulus immediately following the first, no longer can affect the organism in the same manner because the organism was changed by the perception of the first exposure. Piaget (<u>1</u>) states this clearly - "...We can say that perception differs from intelligence in that its structures are intransitive, irreversible, etc."

Perception may be defined in a broader sense, as a welding of the perceptual-cognitive process into an unseparable pair. Taylor (2) notes that "...the bewilderment arises from the assumption that perception is a direct function of stimulation. But if we assume that it is a function of learned behavior there is no more bewilderment..."

Referring to the eyes, a number of studies have indicated that some of the attributes of vision, such as, the refractive error and deviations from "normal" acuity have little if any relationship to school achievement. However, those factors of vision concerned with the binocular functions do show a relationship to early reading and school achievement.

Two major aspects of binocularity (whose efficiency can be determined by the classroom teacher) are ocular motility and visual fatigue. An additional component of binocularity influencing the quality of input (which requires a quantitative testing procedure) is the degree of depth perception. This latter attribute may also be viewed as a measure of coordination of the centering process of the eyes. The centering process controls the manner in which both eyes are directed toward the same object in space.

A means of screening the efficiency of ocular mobility is to have a child follow a moving target (e.g., a fixation object suspended on a string) that the observer controls to cover all directions of eye movement as well as varying distances of fixation (e.g., at a near point of 2 inches, to a distant point of 30 inches, to an intermediate distance of 18 inches). Difficulty or deficiency in this activity will indicate that the child has a problem which allows him a choice of at least three distinct solutions. First,

he may find that fixating at a near point target is too much of a problem and therefore learns to avoid tasks at the near point or reading distance. Second, he may compensate for the difficulty, by some intrinsic motivational drive, thereby achieving in the school environment even though maintaining the poor functional aspects of ocular motility. And third, he will attempt to overcome the difficulty and try to succeed at the near point task, but may not be able, without structured training, to overcome this handicap and therefore, still not achieve at the near point task (3). For example, if the child cannot freely and smoothly move his eyes horizontally and vertically, he will find that he is skipping words and/or lines. In this case, his processing of the environment, the printed page, will not be represented by a true effigy projection and the information derived will be likewise skewed.

Spatial organization, another output of vision, is here meant to describe that ability of the individual to relate himself and objects in a 'true' representation of their spatial interrelationship. Since the human organism at birth, and for a varying period thereafter, relates all aspects of the physical and emotional world egocentrically, it follows that without an adequate body awareness (body image) the development of 'spatial organization' will not reach the level necessary to learn to read. "The perception of the position of the body is therefore an integral part of the perception of the visual world" is a major concept in Taylor's (4) rationale.

Reversals in reading and writing are considered an indicator of a poorly developed spatial organization ability. A simple

demonstration can indicate the invariant relationship between body image and reversals - ask the child to indicate the left (or the right) side of his body and note the elapsed time, indicating some mediating factor is necessary before the child can respond, i.e., "which hand do I salute the flag with?" or "which hand do I throw a ball with?"

Classroom and remedial reading teachers have found that intensive work with the child in the development of an adequate body image, followed or accompanied by tasks emphasizing spatial organization, severely decreased the frequency of reversals previously experienced by the child. This observation tends to reinforce Taylor's statement concerning the interaction of the physical and visual worlds in producing perception. This interrelationship of kinesthetic and visual behaviors is also an instance of the manner in which intersensory development affects the child's ability to respond in the teaching-learning process.

The interdependency of the sensorimotor mechanisms provides another facet in the relationship existing between physical activities, gross and fine motor, and the ability of the child to learn. This interdependency is noted by Held (5) in reporting his experiments measuring learning after vicarious physical activities through visual input as compared with true physical involvement and the accompanying visual input. Held concluded that the vicarious physical experience did not promote learning comparable to that achieved through the actual physical experience. Taylor (6) has further stated that "The visual world and the gravitational world are inseparable components of a unified perceptual world."

The haptic modality (sense of touch) interrelates with the kinesthetic and visual inputs to add another dimension to the

foundation of cognitive growth. For example, the feel, the kinesthetic movement and the visual discrimination of simple geometric forms, that should be common to all classrooms concerned with early childhood education, allow for responses by the child that formally structure the cognitive tasks of classification and categorization, i.e., straight, curved, slanted, number (ordinal and cardinal) and so forth. There are few tests available for the evaluation of the haptic modality. This is another instance of a curriculum contained evaluation technique that would be of use to the classroom teacher.

Auditory discrimination must be examined and dealt with in the same manner as kinesthetic, touch and visual discrimination. However, auditory and visual inputs produce imagery that far surpasses the kinesthetic and haptic sense. Because of this quality, auditory discrimination rivals visual discrimination as the major mode utilized by the organism for learning. McKellar (7) has indicated his concern - "Much that applies to perceptions of these two dominant senses and their imagery merits caution when applied to the 'lower' senses such as touch, temperature, taste and smell."

It is necessary, especially in early childhood education, to teach to the mode to which the child is most responsive. There are programs and tests for phoneme discrimination for primary grade children, but programs and tests that concern the basic components of auditory discrimination (i.e., sound directionality, pitch, loudness, etc.) are lacking for this age group. A comparison of the child's responses to the visual and auditory input programs would allow the teacher to determine the dominant mode.

A teaching-learning methodology for accomplishing a better intersensory development and at the same time reinforcing the less

strong of the major modality inputs is a technique which presents a problem to be solved through one sense modality and then fosters a maximum number of outputs to be used in the response (8). Outputs are defined as the means by which we can communicate our response initiated by the input. Essentially there are three means of communication, e.g., articulatory, graphic and mimetic. Each of these outputs now serves as a feedback input mechanism that operates as a servo mechanism. Therefore, if we require the child's rote (identifying) and cognitive (thinking skill) responses, from an input of a single modality, to be expressed in a multimotoric manner then these outputs will serve as multisensory inputs. For example, if we present, tachistoscopically, a picture of a circle, the child can respond by articulating and writing the name of the form, drawing a picture to represent the form, and by moving his body to designate a circle.

The same responses can be engendered by using materials designed for an auditory input or for a haptic input. Kinesthetic activities can also be designed to foster communication, utilizing a maximum number of outputs.

There are some programs commercially available which use this technique through the use of materials designed to create an environment in which the child will be able to maximize his response patterns. One such program is the detect series (9). The first in the series uses a visual input and is being followed by detect - concrete (haptic input), detect - auditory and detect - kinesthetic. Each of these programs requires rote and cognitive responses. Evaluation of a student is an ongoing process based on his performance in the components of detect.

Such a rationale applied to early childhood education can be described as a systems approach since the outputs may be controlled by, first, varying the inputs, and second, by changing the structure of the response pattern.

A clinical optometrist works to affect the rote and cognitive aspects of perception by including the effects of all of the sense modalities on the perceptual-cognitive process. He utilizes the visual modality as a probe in his testing procedures for assessing the areas of deficit and proficiency in the sensorimotor systems. The classroom teacher is also vitally interested in obtaining similar information. However, she organizes her findings in terms of specific teaching-learning experiences. A systems approach allows the teacher to determine through an ongoing evaluation, first, the major modality used by the child for learning, second, the level of ability in communicating his responses and third, the degree to which the child has mastered the thinking skills using the basic tools of learning, such as, pitch, pattern, line, symbol, directionality, and so forth, that are necessary for the specific subject materials of the school curriculum.

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